3.5 Pg. 146 #1, 3, 5, 7, 11, 13

1. $y = 1 + x - \cos x \qquad \frac{dy}{dx} = 1 - (-\sin x)$

$= 1 + \sin x$

3. $y = \frac{1}{x} + 5\sin x \qquad \frac{dy}{dx} = \frac{-1}{x^2} + 5\cos x$

5. $y = 4 - x^2 \sin x \qquad \frac{dy}{dx} = -2x\sin x - x^2\cos x$

7. $y = \frac{4}{\cos x} \qquad \frac{dy}{dx} = \frac{\cos x\,(0) - 4(-\sin x)}{\cos^2 x}$

$= \frac{4\sin x}{\cos^2 x}$

11. $s = 5\sin t \qquad v(t) = 5\cos t \qquad a(t) = -5\sin t$

$t = 0 \quad s(0) = 0 \quad v(0) = 5 \quad a(0) = 0$

$t = \frac{\pi}{4} \quad s\left(\frac{\pi}{4}\right) = \frac{5\sqrt{2}}{2} \quad v\left(\frac{\pi}{4}\right) = \frac{5\sqrt{2}}{2} \quad a\left(\frac{\pi}{4}\right) = \frac{-5\sqrt{2}}{2}$

$t = \frac{\pi}{2} \quad s\left(\frac{\pi}{2}\right) = 5 \quad v\left(\frac{\pi}{2}\right) = 0 \quad a\left(\frac{\pi}{2}\right) = -5$

$t = \frac{3\pi}{4} \quad s\left(\frac{3\pi}{4}\right) = \frac{5\sqrt{2}}{2} \quad v\left(\frac{3\pi}{4}\right) = \frac{-5\sqrt{2}}{2} \quad a\left(\frac{3\pi}{4}\right) = \frac{-5\sqrt{2}}{2}$

$t = \pi \quad s(\pi) = 0 \quad v(\pi) = -5 \quad a(\pi) = 0$

At $t=0$ the weight is at its rest position moving up at 5 m/sec with no acceleration. Then at $t = \frac{\pi}{4}$ the weight is moving up and slowing down. Then at $t = \frac{\pi}{2}$ the weight is at its highest point, not moving. At $t = \frac{3\pi}{4}$ the weight is at position $\frac{5\sqrt{2}}{2}$ moving down and increasing in speed. etc..

13. $s = 2 + 3\sin t$

a. $v(t) = 3\cos t \quad a(t) = -3\sin t \quad \text{speed} = |3\cos t|$

b. $v\left(\frac{\pi}{4}\right) = \frac{3\sqrt{2}}{2}$ m/sec

$a\left(\frac{\pi}{4}\right) = \frac{-3\sqrt{2}}{2}$ m/sec^2

speed $= \frac{3\sqrt{2}}{2}$ m/sec

$s(0) = 2$ m $\quad v(0) = 3$ m/sec $\quad a(0) = 0$ m/sec^2

$s\left(\frac{\pi}{2}\right) = 5$ m $\quad v\left(\frac{\pi}{2}\right) = 0$ m/sec $\quad a\left(\frac{\pi}{2}\right) = -3$ m/sec^2

$s\left(\frac{3\pi}{4}\right) = 2 + \frac{3\sqrt{2}}{2}$ m $\quad v\left(\frac{3\pi}{4}\right) = \frac{-3\sqrt{2}}{2}$ m/sec $\quad a\left(\frac{3\pi}{4}\right) = \frac{-3\sqrt{2}}{2}$ m/sec^2

$s(\pi) = 2$ m $\quad v(\pi) = -3$ m/sec $\quad a(\pi) = 0$ m/sec^2

$s\left(\frac{5\pi}{4}\right) = 2 - \frac{3\sqrt{2}}{2}$ $\quad v\left(\frac{5\pi}{4}\right) = \frac{-3\sqrt{2}}{2}$ m/sec $\quad a\left(\frac{5\pi}{4}\right) = \frac{3\sqrt{2}}{2}$ m/sec^2

At $t = 0$ the body is at 2m point, moving up at 3 m/sec and not accelerating.

At $t = \frac{\pi}{4}$ the body is at $2 + \frac{3\sqrt{2}}{2}$ m point, moving up at $\frac{3\sqrt{2}}{2}$ m/sec and slowing down.

At $t = \frac{\pi}{2}$ the body is at 5m point, not moving, and ready to move down.

At $t = \frac{3\pi}{4}$ the body is at $2 + \frac{3\sqrt{2}}{2}$ meter point, moving down, and speeding up.

At $t = \pi$ the body is at 2m point, moving down, and not accelerating (not speeding up or slowing down)

At $t = \frac{5\pi}{4}$ the body is at $2 - \frac{3\sqrt{2}}{2}$ m point, moving down, and slowing down.